



[7590-01-P]

NUCLEAR REGULATORY COMMISSION

[Docket Nos. 50-010, 50-237, 50-249, and 72-37; NRC-2016-0046]

Exelon Generation Company, LLC; Dresden Nuclear Power Station, Units 1, 2, and 3; Independent Spent Fuel Storage Installation

AGENCY: Nuclear Regulatory Commission.

ACTION: Exemption; issuance.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is issuing an exemption from certain requirements regarding the storage of a thorium rod canister in response to a request submitted by Exelon Generation Company, LLC (EGC) on January 29, 2015, for its general license to operate an independent spent fuel storage installation (ISFSI) at the Dresden Nuclear Power Station (DNPS). This exemption would permit EGC to load and store the DNPS Unit 1 thorium rod canister containing 18 DNPS Unit 1 thorium rods in a Holtec International, Inc., HI-STORM 100 multi-purpose canister (MPC)-68M using Certificate of Compliance (CoC) No. 1014, Amendment No. 8, Rev. 1¹.

DATES: [INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].

¹ The licensee's application referred to Amendment 8; since that time, Amendment 8 has been revised. (On February 16, 2016, Amendment 8, Rev. 1 to CoC 1014 became effective). The revision does not impact the exemption request that is the subject of this exemption because none of the changes in the revision revised the thorium contents or the physical characteristics of the storage cask.

ADDRESSES: Please refer to Docket ID **NRC-2016-0046** when contacting the NRC about the availability of information regarding this document. You may obtain publicly-available information related to this document using any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2016-0046**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly-available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "ADAMS Public Documents" and then select "[Begin Web-based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. For the convenience of the reader, the ADAMS accession numbers are provided in a table in the "Availability of Documents" section of this document.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Bernard White, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001; telephone: 301-415-6577; e-mail: Bernard.White@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. Background

Dresden Unit 1 produced power commercially from 1960 to October 31, 1978. The plant shut down in October 1978 and is currently in SAFSTOR. The decommissioning plan was approved in September 1993. No significant dismantlement activities are underway. Isolation of Units 1, 2, and 3 is complete.

Consistent with subpart K of part 72 of title 10 of the *Code of Federal Regulations* (10 CFR), a general license is issued for the storage of spent fuel in an ISFSI at power reactor sites to persons authorized to possess or operate nuclear power reactors under 10 CFR part 50. EGC is currently authorized to store spent fuel at the DNPS ISFSI under the 10 CFR part 72 general license provisions. The DNPS ISFSI is currently loading and storing spent fuel in Holtec HI-STORM 100 storage casks, approved by the NRC under CoC No. 1014.

II. Request/Action

By letter dated January 29, 2015, as supplemented on June 8, 2015, EGC submitted a request for an exemption from 10 CFR 72.212(b)(3) and the portion of 10 CFR 72.212(b)(11) that requires compliance with the terms, conditions, and specifications of CoC No. 1014, Amendment No. 8, for the Holtec HI-STORM 100 with the MPC-68M, to the extent necessary for EGC to load and store one DNPS Unit 1 thoria rod canister containing 18 DNPS Unit 1 thoria rods. Upon review, the NRC added the following requirements for the proposed action pursuant to its authority under 10 CFR 72.7: 10 CFR 72.212(a)(2), which limits storage of spent fuel in casks approved under part 72; 72.212(b)(5)(i), which states a “cask, once loaded with spent fuel ... will conform to the terms, conditions and specifications of a CoC or an amended CoC listed in § 72.214”; and 10 CFR 72.214, “List of approved spent fuel storage casks.”

III. Discussion

Pursuant to 10 CFR 72.7, the Commission may, upon application by any interested person or upon its own initiative, grant such exemptions from the requirements of the regulations of 10 CFR part 72 as it determines are authorized by law and will not endanger life or property or the common defense and security, and are otherwise in the public interest.

A. Authorized by Law

This exemption would permit the applicant to load and store the DNPS Unit 1 thoria rod canister containing 18 DNPS Unit 1 thoria rods in the HI-STORM 100 MPC-68M CoC 1014, Amendment No. 8, Rev. 1, which otherwise would not permit the storage of thoria rods. The provisions from which the NRC is granting the exemption require the licensee to comply with the terms, conditions, and specifications of the CoCs for the approved cask model it uses. Section 72.7 allows the Commission to grant exemptions from the requirements of 10 CFR part 72 if the exemption is authorized by law, will not endanger life or property or the common defense and security, and is otherwise in the public interest. As explained in the following discussion, the proposed exemption will not endanger life or property, or the common defense and security, and is otherwise in the public interest. Issuance of this exemption is consistent with the Atomic Energy Act of 1954, as amended, and not otherwise inconsistent with NRC's regulations or other applicable laws. Therefore, issuance of the exemption is authorized by law.

B. Will Not Endanger Life or Property or the Common Defense and Security

Approval of this exemption request will allow EGC to load and store the 18 thoria rods in the DNPS Unit 1 thoria rod canister within a Holtec HI-STORM 100 MPC-68M. As discussed in the following section, the NRC staff finds that EGC's proposal to load and store thoria rods is acceptable and will not endanger life or property or common defense and security.

Review of the Requested Exemption

The addition of the MPC-68M to the list of approved storage cask designs for the Holtec HI-STORM 100 system was reviewed previously and approved by the NRC. The CoC and safety evaluation report (SER) for Amendment 8 were issued on May 10, 2012, corrected on November 12, 2012, and revised on February 16, 2016. Amendment No. 8 added the MPC-68M canister, two new boiling water reactor (BWR) fuel assembly/array classes, a new pressurized-water reactor fuel assembly/array class, and revised Condition No. 3 in the certificate to include leak testing of the confinement boundary base material in addition to confinement welds. Amendment 8 also made other administrative changes. Thoria rods/assemblies were not considered in Amendment No. 8 for the MPC-68M, however they have been approved for storage in the MPC-68, MPC-68F and MPC-68FF in Amendment No. 1.

The applicant stated that the design characteristics of the thoria rods in the exemption request are the same as those approved for storage in the MPC-68, MPC-68F and MPC-68FF. The characteristics of these rods are specified in CoC No. 1014, Amendment No. 8, Revision No. 1, Appendix B, Table 2.1-1, Section II, "MPC MODEL: MPC-68F," Item A.7 and Section III, "MPC MODEL: MPC-68 and MPC-68FF," Item A.3. In addition, the applicant cited the Safety Analysis Report (SAR) for CoC No. 1014, Amendment No. 8, and the NRC staff's corresponding SER dated May 10, 2012, which documented the NRC staff's basis for approval of Amendment No. 8, to support the exemption request.

The NRC staff reviewed the requested exemption and determined that it does not change the fundamental design, components, or safety features of the storage system. The NRC staff evaluated the applicable potential safety impacts of granting the exemption to assess the potential for any danger to life or property or the common defense and security. Specifically, the NRC staff reviewed the applicant's structural integrity, thermal, confinement, shielding, and criticality evaluations for the proposed exemption.

Structural Review for the Requested Exemption: The NRC staff reviewed the exemption request including the documents referenced by the applicant. Specifically, the NRC staff reviewed the design characteristics of thorium rods and canister limits provided by the applicant in its June 8, 2015, response to NRC's request for additional information (RAI) dated May 8, 2015, and verified that the thorium rods and canister limits are the same as those previously approved in Amendment No. 1 to CoC 1014. In its review of Amendment No. 8, the NRC staff determined that the structural analysis presented in "HI-STORM Topical Safety Analysis Report (TSAR)," Holtec Report HI-951312, Rev. 11, as supplemented on July 3, 2001, August 13 and 17, and October 5, 12, and 19, 2001,, demonstrated that the thorium rod canister was structurally adequate to support the loads during normal lifting operations, normal and off-normal conditions, as well as during postulated-accident conditions.

Based on the NRC staff's review of the physical characteristics of the thorium rods, thorium canister and MPC-68M canister, the NRC staff concludes that the proposed storage of thorium rods in an MPC-68M will be bounded by the previously approved structural analysis for MPC-68M because the thorium rods and canister limits are the same as those previously approved in Amendment No. 1 to CoC 1014. Therefore, the NRC staff has reasonable assurance that the structural adequacy of the MPC-68M for the intended purpose will be maintained, as documented in the NRC staff's SER for Amendment No. 8 to CoC 1014.

Thermal Review for the Requested Exemption: The decay heat per DNPS Unit 1 thorium rod canister is less than or equal to 115 watts, which is significantly lower than the maximum allowable decay heat limit of 393 watts per fuel storage location for damaged fuel and fuel debris, as specified in Amendment No. 8 to CoC 1014. In addition, the exemption, does not change the cask decay heat distribution due to the lower decay heat of the DNPS Unit 1 thorium rod canister. Accordingly, the decay heat analyses reviewed and approved by the NRC staff in Amendment 8 are bounding.

The applicant referenced the previous Holtec thermal evaluation of the MPC-68M for Amendment No. 8 to CoC 1014 to show that it has lower maximum temperatures (i.e., fuel cladding, basket, and MPC shell) than the maximum temperatures of Holtec's thermal evaluation for the MPC-68 canister. Holtec stated that this is due to the higher thermal conductivity of the Metamic-HT basket material, the use of full length aluminum basket shims, and the higher emissivities of the basket and basket shims. Based on the NRC staff's review of the exemption request and the references cited therein, the NRC staff finds acceptable the small decay heat contribution of the thorium rods, when compared with the design basis-heat load for failed fuel. In addition, the NRC staff finds that the thermal effects of an MPC-68M basket design loaded with one DNPS Unit 1 thorium rod canister is bounded by previous thermal analysis. Therefore, if one DNPS Unit 1 thorium rod canister is included in an MPC-68M, the NRC staff concludes that the fuel cladding temperature of the MPC-68M and its contents are bounded by those NRC reviewed and approved for CoC 1014, Amendment No. 8.

The applicant stated that the cladding hoop stress for the thorium rods, during vacuum drying, is similar to the stresses expected in uranium dioxide (UO₂) rods stored in an MPC-68M. The applicant also stated it does not plan to load high burnup fuel, i.e., fuel with an average burnup exceeding 45,000 MWD/MTU, in the MPC-68M that contains the thorium rod canister. The applicant stated that this would result in a decay heat below the design basis decay heat and, therefore a lower design basis fuel temperature compared to the value reported in Table

4.III.5 of the HI-STORM 100 FSAR, Revision 11, during vacuum drying operations. Based on the lower decay heat and similar expected cladding hoop stress for the thoria rods during vacuum drying, the NRC staff finds that the vacuum drying time limits in CoC 1014, Amendment No. 8, Revision No. 1, Technical Specifications, which were not necessary for the MPC-68M in CoC 1014, Amendment No. 8, Revision No. 1, are also not necessary for the MPC-68M with the inclusion of the DNPS Unit 1 thoria rod canister. Consistent with EGC's request, this exemption does not authorize the loading and storage of high burnup fuel in the MPC-68M if the DNPS Unit 1 thoria rod canister is loaded in the MPC-68M. Accordingly, the NRC staff finds that the cask loaded with 1 thoria rod canister will continue to meet applicable thermal requirements.

Confinement Review for the Requested Exemption: EGC stated that the design of the MPC-68M confinement boundary, which includes the vent and drain ports, is unchanged by the exemption request. In addition, EGC stated that the exemption would not change the short-term cask operations, including draining of the MPC, welding of the lid, drying and backfilling with inert gas, and handling of the MPC that were approved in Amendment No. 8 to CoC No. 1014. Since this exemption would not change the design aspects, including a leak tight confinement boundary (leak tight is defined as $\leq 1 \times 10^{-7}$ ref-cc/sec, as defined by American National Standards Institute (ANSI) N14.5, "Radioactive Materials - Leakage Tests on Packages for Shipment"), from those previously reviewed and approved by the NRC, the confinement characteristics will continue to be adequately maintained.

Shielding Review for the Requested Exemption: The NRC staff reviewed the exemption request and the applicant's RAI response. EGC is relying on NRC's previous approval of Amendment Nos. 1 and 8 to CoC No. 1014 to conclude that offsite doses from a storage cask containing a single thoria rod canister along with 67 design basis 6x6 Dresden Unit 1 fuel assemblies are the same as or bounded by previous analyses and did not perform any

additional analysis for this exemption. The applicant cites the shielding analysis of the thorium rods as previously documented in "HI-STORM TSAR," HOLTEC Report HI-951312, Rev. 11, and approved by the NRC staff in CoC 1014, Amendment No. 1 and documented in the NRC staff's SER dated July 18, 2002. Sections 5.2.6 and 5.4.8 of the Holtec TSAR includes Holtec's analysis of the thorium rods, and presents a summary of the neutron and photon sources in Tables 5.2-7, 5.2-19, 5.2-37, and 5.2-38. EGC stated that the neutron source for the thorium rods remains below that of the design basis fuel assembly. EGC also stated that the photon source for the thorium rods is bounded by the design basis fuel assembly except in the 2.5-3.0 MeV energy range. To demonstrate that the gamma dose rate from the thorium rods is bounded by the design-basis BWR fuel, EGC referred to Holtec's TSAR for Amendment No. 1, which, according to Holtec, conservatively assumed 68 thorium rod canisters were present in the MPC, even though only one thorium rod canister exists on the DNPS site. Holtec's dose rate evaluation showed that the external dose rate for a HI-STORM 100 cask loaded with 68 thorium rod canisters, each with 18 Thorium rods, was 17 percent higher than a canister filled with design-basis fuel. In its SER for approval of Amendment No. 1, the NRC staff considered the conservatisms built into Holtec's dose rate analysis and concluded that a single thorium rod canister would not likely result in a dose rate increase for a MPC-68M canister loaded with 67 BWR spent fuel assemblies and a single thorium rod canister containing up to 18 thorium rods.

Subsequently, in its review of Amendment 8, the NRC staff reviewed the impact from the MPC-68M basket on external dose rates compared to the borated baskets for the other MPC-68 canisters. Considering that the outer loaded assemblies provide significant shielding of the innermost assemblies, the NRC staff determined that the dose rate is dominated by the peripherally loaded assemblies. The NRC staff, using MicroShield[®], calculated dose rates with the two different basket materials. Based on the results of this calculation, the NRC staff found that the canister and overpack were the components most critical to shielding. Additionally, in the SER for Amendment No. 8, NRC staff concluded that Holtec showed that the shielding

provided by the MPC-68M did not significantly change from the MPC-68 canister, since neither the canister shell nor the overpack changed and the Metamic-HT basket would have negligible impact on external dose rates.

In prior NRC staff reviews of Amendment Nos. 1 and 8, the NRC staff concluded that the Metamic-HT basket in the MPC-68M has very little effect on the external dose rate; and a single thorium rod canister, while unbounded in the 2.5-3.0 MeV energy range, will not impact cask external dose rates. Accordingly, NRC staff has reasonable assurance that off-site doses from the presence of a single, thorium rod canister in an MPC-68M loaded with design-basis fuel with the same characteristics as those approved for the MPC-68, MPC-68F and MPC-68FF will not increase when compared to a canister loaded with 68 design-basis fuel assemblies. Therefore, such a canister will continue to meet applicable offsite dose requirements.

Criticality Review for the Requested Exemption: The NRC staff reviewed the exemption request and the applicant's RAI response. The applicant initially only cited the criticality analysis of the thorium rods previously documented in "HI-STORM TSAR", Holtec Report HI-951312, Rev. 11, and documented in the NRC staff's SER dated July 18, 2002, which was the basis for approval of Amendment No. 1 to CoC No. 1014. In Section 6.4.6 of the TSAR, Holtec shows that the reactivity of the thorium rods remains below that of the design-basis fuel assembly reactivity, which is summarized in Holtec TSAR Tables 6.1.7 and 6.1.8. The NRC staff did not analyze any impact the thorium rods might have on criticality during its review of the Holtec TSAR as the components important to criticality control in the MPC-68 and MPC-68FF remained unchanged from its prior review of the HI-STAR Amendment No. 1. This is not the case with the MPC-68M.

In its June 8, 2015 response to additional information, the applicant cited the NRC staff's basis for approval of CoC 1014, Amendment No. 8 in its SER dated May 10, 2012, to support this exemption request. The applicant noted several advantages that Metamic-HT has over

older basket designs. Among them are the inability of the neutron absorber material to detach or relocate, and the presence of absorber material along the entire length of the basket, rather than a fixed, discrete section. During its review of Amendment No. 8, NRC staff noted that the applicant's analysis resulted in a large margin to criticality and concluded that the use of the existing fuel assemblies authorized in the CoC within the Metamic-HT basket in the MPC-68M would remain subcritical.

Two prior NRC staff reviews of amendments (HI-STORM Amendment Nos. 1 and 8) have found the Metamic-HT basket in the MPC-68M to be at least as effective as those in the MPC-68 and MPC-68FF. In addition, these reviews found that a thoria rod canister is less reactive than the spent fuel assemblies currently authorized in CoC 1014. Based on its consideration of these previous approvals, NRC staff concludes that the presence of a single, thoria rod canister in an MPC-68M is bounded by prior analyses of existing, authorized contents.

Review of Common Defense and Security: The NRC staff also considered potential impacts of granting the exemption on the common defense and security. The requested exemption is not related to any security or common defense aspect of the DNPS ISFSI, therefore granting the exemption would not result in any potential impacts to common defense and security.

Based on its review, the NRC staff has reasonable assurance that in granting the exemption, the storage system will continue to meet the requirements of 10 CFR part 72 and the offsite dose limits of 10 CFR part 20 and, therefore, will not endanger life or property. The NRC staff also finds that the exemption would not endanger common defense and security.

C. Otherwise in the Public Interest

In considering whether granting the exemption is in the public interest, the NRC staff considered the alternative of not granting the exemption. If the exemption was not granted, in

order to comply with the CoC, the DNPS Unit 1 thoria rod canister containing the 18 thoria rods would not be loaded during the 2016 spent fuel loading campaign (SFLC). The applicant maintains that loading the thoria rod canister during the 2016 DNPS SFLC is part of a program to ensure full core discharge capability.

EGC stated that granting the exemption is in the public interest since it will permit storage of the thoria rods in an inherently safe and passive system. Additionally, EGC stated that granting the exemption would permit this storage without the burden and impact of requesting an amendment to the CoC. Not granting the exemption would require Holtec to submit an amendment to the CoC, which would delay the DNPS program to ensure full core discharge capability and impact future loadings. In addition to allowing DNPS to continue with its program to ensure full core discharge capability on schedule, based on its review of EGC's request, the NRC staff concludes that allowing thoria rods with the same characteristics as those approved for the MPC-68, MPC-68F and MPC-68FF as an approved content in the MPC-68M would continue to provide adequate protection of public health and safety. Therefore, granting the exemption is otherwise in the public interest.

D Environmental Considerations

The NRC staff also considered whether there would be any significant environmental impacts associated with the exemption. For this proposed action, the NRC staff performed an environmental assessment pursuant to 10 CFR 51.30. The environmental assessment concluded that the proposed action would not significantly impact the quality of the human environment. The NRC staff concluded that the proposed action would not result in any changes in the types or amounts of any radiological or non-radiological effluents that may be released offsite, and there is no significant increase in occupational or public radiation exposure because of the proposed action. The Environmental Assessment and the Finding of No Significant Impact was published on March 4, 2016 (81 FR 11603).

IV. Conclusions

Accordingly, the Commission has determined that, pursuant to 10 CFR 72.7, this exemption is authorized by law, will not endanger life or property or the common defense and security, and is otherwise in the public interest. Therefore, the Commission hereby grants EGC an exemption from 10 CFR 72.212(a)(2), 10 CFR 72.212(b)(3), 10 CFR 72.212(b)(5)(i), 10 CFR 72.214, and the portion of 10 CFR 72.212(b)(11) that requires compliance with terms, conditions, and specifications of the CoC only with regard to storage of DNPS Unit 1 thoria rods with the same characteristics as those specified for storage in the MPC-68, MPC-68F and MPC-68FF in CoC No. 1014, Amendment No. 8, Revision No. 1, Appendix B, Table 2.1-1, Section II, "MPC MODEL: MPC-68F," Item A.7 and Section III, "MPC MODEL: MPC-68 and MPC-68FF," Item A.3 in the MPC-68M using the Holtec® CoC No. 1014, Amendment No. 8, Revision No. 1. This exemption does not authorize loading in a canister with other spent fuel which has an average burnup exceeding 45,000 MWD/MTU.

V. Availability of Documents

The documents identified in the following table are available to interested persons through one or more of the methods indicated in the "ADDRESSES" section.

Document	ADAMS Accession No.
Exelon Generation Company (EGC) application dated January 29, 2015	ML15029A334
EGC supplement dated June 8, 2015	ML15159A745
CoC 1014 Amendment 8, Revision 1	ML16041A233
Amendment No. 8 CoC and SER issued on May 10, 2012	ML12132A028
Amendment No 8 correction (CoC and SER) issued on November 12, 2012	ML12213A203
Amendment No. 8, Revision No. 1 issued on February 10, 2016	ML16041A233
"HI-STORM Topical Safety Analysis Report (TSAR)," Holtec Report HI-951312, Rev. 11 (Holtec amendment 1 request) dated August 31, 2000	ML003748149, ML072420266, ML003748010, ML003747975, and ML003747995
July 3, 2001 supplement to Holtec amendment 1 request	ML011900259
August 13, 2001 supplement to Holtec amendment 1 request	ML012260436
August 17, 2001 supplement to Holtec amendment 1 request	ML012330523
October 5, 2001, supplement to Holtec amendment 1 request	ML012830522

October 12, 2001, supplement to Holtec amendment 1 request	ML012900007
October 19, 2001, supplement to Holtec amendment 1 request	ML020150094
NRC's request for additional information dated May 8, 2015	ML15128A088
Amendment No. 1 to CoC 1014	ML022000176
HI-STORM 100 FSAR, Revision 11	ML13246A040
ANSI N14.5, "Radioactive Materials - Leakage Tests on Packages for Shipment"	Accessible from American National Standards Institute
HI-STAR Amendment No. 1	ML003780760

The exemption is effective upon issuance.

Dated at Rockville, Maryland, this 8th day of March, 2016.

For the Nuclear Regulatory Commission.

Steve Ruffin,
Acting Branch Chief,
Spent Fuel Licensing Branch,
Division of Spent Fuel Management,
Office of Nuclear Material Safety
and Safeguards.

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